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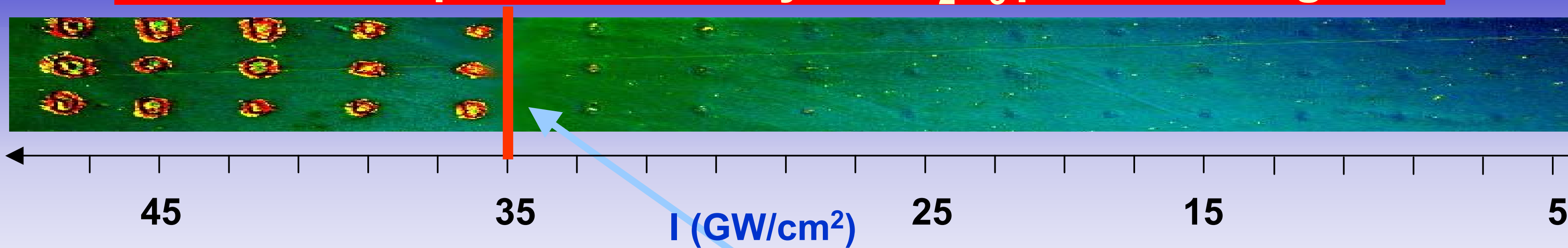
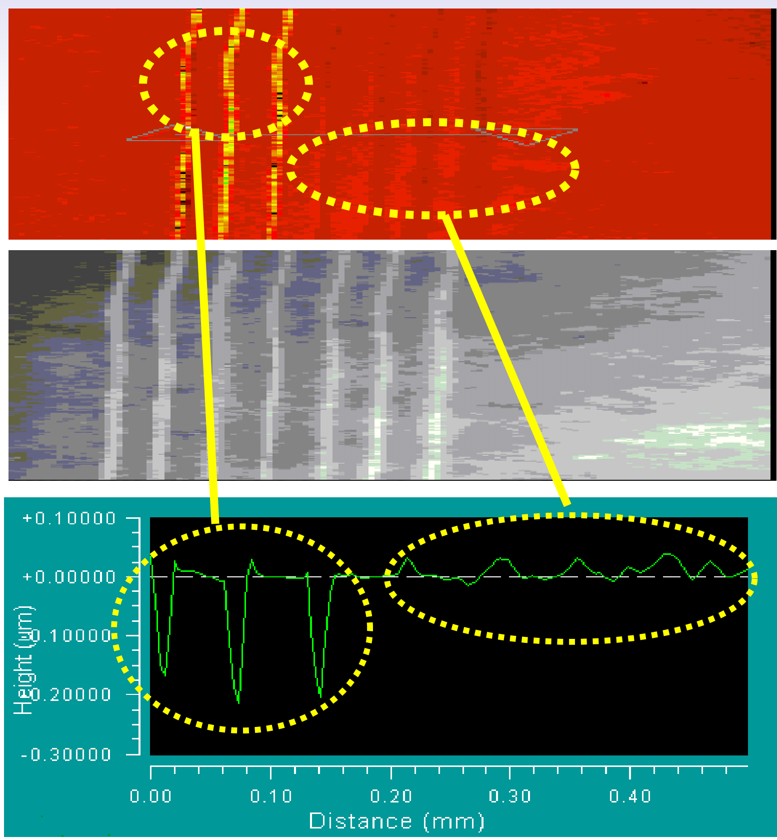
Evaluation of photosensitivity in As_2S_3 planar waveguides



Deterministic ablation threshold at ~35 GW/cm²



Trenches ablated *within* the chalcogenide thin film (L)

Waveguides created by photoexpansion; visible with interferometric map (R)

2 possible fabrication regimes create *element fabrication flexibility*

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in Optics and Lasers

This slide illustrates results of our ongoing effort to examine bulk/film structural differences in Chalcogenide glasses (ChG's). Using fs pulses of a Ti:sapphire (λ=800 nm) laser, we have shown for the first time, the exposure (intensity) threshold where laser irradiation of the film, transitions from an expansive to ablative mechanism. Knowledge of these two regimes, allows a film to be structured either with an exposure-induced index change (resulting in photoexpansion of the glass structure) or ablative material removal (shown as trenches in the material). Such information allow us to tailor the exposure conditions to create a range of structures in a single film material. By understanding the aging behavior of such structures, long-lived structural changes can be imparted in the glass, despite it's low Tg. Such material modification will lead to our abilitiy to optimize device on chip components from ChG's that are robust and stable.

These efforts are in partnership with Dr. M. Richardson's *Laser Plasma Laboratory* at CREOL. Material Science, Physics and Optics students are collaborating to correlate how the laser physics and corresponding photo-induced structural changes that occur in the glass films vary from those seen in bulk glass materials. These changes are interpreted through analysis of structural variation in the as-deposited film structure (using Waveguide Raman Spectroscopy), and the glass' linear and nonlinear refractive index. We are expanding our experimental facilties to include in-situ writing and analysis capabilities to allow dynamic evaluation of materials.